

**ENGINEERING EVALUATION REPORT
VALERO REFINING COMPANY – CALIFORNIA
PLANT NO. – 12626
APPLICATION NO. 15662**

INTRODUCTION

This application is to bank Interchangeable Emission Reduction Credits (IERCs), in accordance with District Regulation 2, Rule 9, from the carbon monoxide furnaces listed below at the Valero Refining Company in Benicia, CA.

S-3 Crude Preheat Furnace, F-101
S-4 Reduced Crude Preheat Furnace, F-102

The emission reductions are the result of the Thermal De-NO_x system (A-25). Sources S-3 and S-4 share a common stack with source S-7 (Jet Fuel Hydrofining Furnace). The Thermal De-NO_x system is located downstream from S-3 and S-4, and upstream of S-7. Emissions from S-3 and S-4 are the difference between total emissions from the common stack and emissions from S-7.

Since December 1994, Valero has measured the NO_x concentration from the common stack using a continuous emission monitor (CEM). Prior to that time, source tests were performed to determine the NO_x concentration. In October 1999, Valero installed a flue gas flow meter to measure exhaust flow from the stack.

Under application numbers 19971, 4398 and 11890, the District has already approved IERCs from S-3 & S-4 for 7 credit generation periods (CGPs). This application is to bank IERCs from three additional credit generation periods that have elapsed since the prior banking applications. The credit generation periods for this application are calendar years 2004, 2005 and 2006 (CGP₈, CGP₉ and CGP₁₀).

IERC CALCULATIONS

The procedure for calculating IERCs is described in Regulation 2, Rule 9, Sections 602 and 603. This application relies on baseline data that was established in AN 19971. The evaluation procedure that follows is the same procedure that was used in AN 19971.

Baseline Data:

The baseline data from AN 19971 is summarized below:

Baseline Period	January 1, 1992 through December 31, 1996
Baseline Throughput	127,300 barrels/day
Baseline Emissions	12,622 lb NO_x/day (2303.5 tons of NO_x)
Baseline Emission Rate	0.09915 lb NO_x / bbl of crude

Determine the Baseline Adjusted Emission Rate:

S-3 and S-4 have been subject to the 300 ppm NO_x limit (at 3% oxygen) in Regulation 9, Rule 10, Section 303.1 since May 31, 1995. On July 1, 2002, the 150 ppm limit in Reg. 9-10-304 became effective. Therefore, it is necessary to adjust the baseline emission rate to account for the 150 ppm limit.

From AN 11971, the baseline emission rate was 0.09915 lb/barrel. The average NO_x concentration during the baseline period was 264 ppm @ 3% O₂. Therefore, the adjusted baseline emission rate that is equivalent to 150 ppm is:

$$(150 \text{ ppm}/264 \text{ ppm})(0.09915 \text{ lb/bbl}) = 0.0563 \text{ lb NO}_x/\text{bbl}$$

Determine the Baseline Adjusted Emissions (A):

Baseline adjusted emissions are calculated by multiplying the baseline throughput by the baseline adjusted emission rate for that particular CGP. The baseline adjusted emissions (A_x where x is the CGP number) are:

$$A_8 = (127,300 \text{ bbl/day}) (366 \text{ days leap yr}) (0.0563 \text{ lb NO}_x/\text{bbl}) (\text{ton}/2000 \text{ lb}) = \mathbf{1311.6 \text{ tons NO}_x}$$

$$A_9 \text{ \& } A_{10} = (127,300 \text{ bbl/day}) (365 \text{ days}) (0.0563 \text{ lb NO}_x/\text{bbl}) (\text{ton}/2000 \text{ lb}) = \mathbf{1308.0 \text{ tons NO}_x}$$

Determine the Actual Emissions (B) During each Credit Generation Period:

The three credit generation periods (CGPs) covered by this banking application are:

CGP₈ – Jan. 1 through Dec. 31, 2004

CGP₉ – Jan. 1 through Dec. 31, 2005

CGP₁₀ – Jan. 1 through Dec. 31, 2006

Emissions are calculated from data provided by Valero in this banking application, and included as attachments to this report. The NO_x concentrations were measured by a continuous emission monitor (CEM). The exhaust flow rates were measured by a pitot tube flow meter.

As discussed above, sources S-3 and S-4 share a common stack (Main Stack) with source S-7. Valero measures NO_x concentration and exhaust flow rate for the Main Stack. To calculate emissions from S-3 and S-4, first calculate emissions from the Main Stack, and then subtract emissions from S-7.

Main Stack Emissions:

Actual emissions are determined by multiplying the annual average NO_x concentration (Attachment B-7) and exhaust flow rate (Attachment B-2). The actual exhaust flow rate is first adjusted to dry standard cubic feet per minute (dscfm) using the annual average temperature (Attachment B-3), and the exhaust water content of 13.3%.

There were 3 Field Accuracy Tests conducted by the District on 2/8/05, 12/6/05 and 7/25/06. Valero's measured NO_x concentrations were lower than the District's measurements by 7.4%, 4.0% and 7.1% on the respective test dates. To be most conservative, the NO_x concentrations for each CGP will be adjusted (increased) by the respective percentages above, yielding fewer IERCs. For 2005 (CGP₉), this adjustment is based on the average of the 2 tests [(7.4 + 4.0) / 2 = 5.7%]. Since there is no test available for 2004 (CGP₈), this adjustment is based on the averages for 2005 and 2006 [(5.7 + 7.1) / 2 = 6.4%].

CGP₈: For 2004, furnaces only operated for 338 days

Standard flow =

$$(862,400 \text{ acfm}) \left(\frac{(460+70)}{(460+630)} \right) (1.0 - 0.133) = 363,561 \text{ dscfm}$$

Emissions =

$$(59 \times 10^{-6}) (1.064) (363,561 \text{ cfm}) (1440 \text{ min/d}) (338 \text{ d/yr}) (\text{lb-mol}/387 \text{ cf}) (46 \text{ lb/lb-mol}) = 1,320,374 \text{ lbs NOx} (660.2 \text{ tons of NOx})$$

CGP₉

$$\text{Standard flow} = (873,800 \text{ acfm}) \left(\frac{(460+70)}{(460+609)} \right) (1.0 - 0.133)$$

$$= 375,603 \text{ dscfm}$$

$$\text{Emissions} = (63 \times 10^{-6}) (1.057) (375,603 \text{ cfm}) (525600 \text{ min/yr}) (\text{lb-mol}/387 \text{ cf}) (46 \text{ lb/lb-mol}) = 1,562,596 \text{ lbs NOx} (781.3 \text{ tons of NOx})$$

CGP₁₀

$$\text{Standard flow} = (826,000 \text{ acfm}) \left(\frac{(460+70)}{(460+538)} \right) (1.0 - 0.133)$$

$$= 380,316 \text{ dscfm}$$

$$\text{Emissions} = (60 \times 10^{-6}) (1.071) (380,316 \text{ cfm}) (525600 \text{ min/yr}) (\text{lb-mol}/387 \text{ cf}) (46 \text{ lb/lb-mol}) = 1,526,819 \text{ lbs NOx} (763.4 \text{ tons of NOx})$$

S-7 Emissions:

Emissions from S-7 are calculated from fuel usage (Attachment B-5), fuel heat content (Attachment B-6), and a NOx emission factors based on actual sources tests during each CGP.

CGP₈: S-7 operated 304 days in 2004

$$(382,000 \text{ cf/d}) (1166 \text{ BTU/cf}) (0.167 \text{ lb NOx/MM BTU}) (\text{MM}/10^{-6}) (304 \text{ d}) (\text{ton}/2000 \text{ lb}) = 11.3 \text{ tons NOx}$$

CGP₉

$$(439,000 \text{ cf/d}) (1110 \text{ BTU/cf}) (0.118 \text{ lb NOx/MM BTU}) (\text{MM}/10^{-6}) (365 \text{ d}) (\text{ton}/2000 \text{ lb}) = 10.5 \text{ tons NOx}$$

CGP₁₀

$$(407,000 \text{ cf/d}) (1077 \text{ BTU/cf}) (0.142 \text{ lb NOx/MM BTU}) (\text{MM}/10^{-6}) (365 \text{ d}) (\text{ton}/2000 \text{ lb}) = 11.4 \text{ tons NOx}$$

Actual emissions from S-3 and S-4 (B_x where x represents the CGP number) are:

$$\mathbf{B_8 = 660.2 - 11.3 = 648.9 \text{ tons NOx}}$$

$$\mathbf{B_9 = 781.3 - 10.5 = 770.8 \text{ tons NOx}}$$

$$\mathbf{B_{10} = 763.4 - 11.4 = 752.0 \text{ tons NOx}}$$

Determine Credit Generation Period Non-Curtailment Emissions (C):

The non-curtailment emission rate (C) for a given credit generation period (CGP) is calculated by multiplying the baseline throughput (127,300 bbl/day) by the emission rate for that CGP. The emission rates for the CGP₈, CGP₉ and CGP₁₀ are calculated by dividing annual emissions by annual crude throughput.

Emission rates:

$$\text{CGP}_8 \text{ Em. Rate} = [(648.9 \text{ ton}) (2000 \text{ lb/ton})] / [(123800 \text{ bbl/day}) (338 \text{ days})] = 0.0310 \text{ lb / bbl}$$

$$\text{CGP}_9 \text{ Em. Rate} = [(770.8 \text{ ton}) (2000 \text{ lb/ton})] / [(132800 \text{ bbl/day}) (365 \text{ days})] = 0.0318 \text{ lb / bbl}$$

$$\text{CGP}_{10} \text{ Em. Rate} = [(752.0 \text{ ton}) (2000 \text{ lb/ton})] / [(128500 \text{ bbl/day}) (365 \text{ days})] = 0.0321 \text{ lb / bbl}$$

$$\mathbf{C_8 = (127,300 \text{ bbl/day}) (0.0310 \text{ lb/bbl}) (366 \text{ day/y}) (\text{ton}/2000 \text{ lb}) = 722.2 \text{ tons}}$$

$$\mathbf{C_9 = (127,300 \text{ bbl/day}) (0.0318 \text{ lb/bbl}) (365 \text{ day/y}) (\text{ton}/2000 \text{ lb}) = 738.8 \text{ tons}}$$

$$\mathbf{C_{10} = (127,300 \text{ bbl/day}) (0.0321 \text{ lb/bbl}) (365 \text{ day/y}) (\text{ton}/2000 \text{ lb}) = 745.8 \text{ tons}}$$

Calculate IERCs for each Credit Generation Period:

IERCs are calculated by subtracting the greater of either the actual emissions (B) or the non-curtailment emissions (C) from the baseline emissions (A).

As indicated above, **A₈ = 1311.6 tons, and A_{9&10} = 1308.0 tons**

For CGP₈, C₈ is greater than B₈. Therefore, the amount of IERCs is:

$$A_8 - C_8 = 1311.6 - 722.2 = \mathbf{589.4 \text{ tons}}$$

For CG₉, B₉ is greater than C₉. Therefore, the amount of IERCs is:

$$A_9 - B_9 = 1308.0 - 770.8 = \mathbf{537.2 \text{ tons}}$$

For CG₁₀, B₁₀ is greater than C₁₀. Therefore, the amount of IERCs is:

$$A_{10} - B_{10} = 1308.0 - 752.0 = \mathbf{556.0 \text{ tons}}$$

STATEMENT OF COMPLIANCE

For an emission reduction to be banked as an IERC, the reduction must be real, permanent, quantifiable, enforceable and surplus (Section 2-1-301.2).

Real: As defined in Section 2-9-214, real means that the emission reduction constitutes an actual decrease in air emissions. There was an actual decrease in emissions to the atmosphere, as is evident from source testing and continuous emission monitoring (CEM) data. The emission reductions evaluated in this application are real.

Permanent: As defined in Section 2-9-213, permanent means that the emission reduction exists for the duration of the credit generation period (CGP). Since both CGPs have already ended, the emission reductions are permanent.

Quantifiable: Quantifiable means that the emission reductions are based on data from emissions measurements. The emission calculations were performed using crude throughput records, source test data and continuous emission monitoring data. These emission reductions evaluated in this application are quantifiable.

Enforceable: As defined in Section 2-9-209, enforceable means that there is credible evidence during the credit generation periods to verify compliance with Regulation 2, Rule 9. The evaluation of this banking application is based on actual crude throughput records, source test data and CEM data. The emission reductions evaluated in this application are enforceable.

Surplus: As defined in Section 2-9-218, surplus means that the emission reductions are not required by Reasonably Available Control Technology (RACT), Best Available Retrofit Control Technology (BARCT), or any other rule in effect during the credit generation period. In addition, emissions reductions must exceed any reduction required by the most recent Clean Air Plan or Air Quality Management Plan.

Regulation 9, Rule 10, Section 304.1 contains a limit of 150 ppm, which became effective on July 1, 2002. The District considers this limit to constitute BARCT. The baseline emissions have been adjusted to reflect this BARCT limit.

The District's most recent plan is the 2005 Ozone Strategy, which was adopted January 4, 2006. This plan contains a base-year emission inventory for 2002, and projected emission inventories for subsequent years broken out by source category. To determine whether or not the IERCs requested by Valero are surplus to the most recent plan, staff compared the 2002 base inventory and 2004 - 2006 inventory projections with actual emissions and IERC usage in 2004 - 2006. This was done for all facilities that have generated or used IERCs to date. The emission inventory exceeds the sum of actual emissions and ERC/IERC use/generation. Therefore, the IERCs requested in this application are surplus.

PUBLIC COMMENT

IERCs for CGP₈, CGP₉ and CGP₁₀ exceed 40 tons. Therefore, this application is subject to the public comment provisions of Section 2-9-405.

RECOMENDATION

Staff recommends the District issue a 30-day public notice regarding the preliminary decision to approve the following IERCs for Credit Generation Periods 8, 9 and 10 for emission reductions that occurred at the Valero refinery.

Credit Generation Period #8: January 1 through December 31, 2004

IERCs = 589.4 Tons of Nitrogen Oxides

Effective Date: January 1, 2005

Expiration Date: December 31, 2009

Credit Generation Period #9: January 1 through December 31, 2005

IERCs = 537.2 Tons of Nitrogen Oxides

Effective Date: January 1, 2006

Expiration Date: December 31, 2010

Credit Generation Period #10: January 1 through December 31, 2006

IERCs = 556.0 Tons of Nitrogen Oxides

Effective Date: January 1, 2007

Expiration Date: December 31, 2011

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